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DISCOVERIES AND IMPROVEMENTS, IN ARTS, MANUFACTURES, AND AGRICULTURE.

THE following article is extracted from "the Edinburgh Encyclopædia, conducted by David Brewster, L. L. D. Fellow of the Royal Society of Edinburgh, and the Society of the Antiquities of Scotland, with the assistance of Gentlemen eminent in Science and Literature."

The merits of this well written essay will, we trust, recommend it to our readers, who will find in it a good account of bleaching, and of the new discoveries in this art, so necessary to be studied in this country.

BLEACHING, is the art by which those manufactures which have vegetable substances for their raw material, are freed from the colouring matter with which such substances are naturally combined, or accidentally stained; and the pure vegetable fibre, deprived of these coloured matters, is left to reflect the different rays of light in due proportion, so as to appear white.

Besides the spoils of animals, mankind, to supply their natural want of covering, have, in all countries, had recourse to vegetable substances, preferring those whose fibres excelled in strength, durability, and pliancy; and experience having proved, that flax and cotton were well adapted to such purposes, these substances have been very generally adopted; and formed into such cloths as the skill and industry of the wearers could execute.

It would soon be observed, that the action of water, together with that of the sun and air, rendered those rude cloths whiter than they were at their first formation; and, since the first step towards refinement is to add beauty to utility,

as the state of society improved, a desire to give them a pure and spotless white would naturally arise. The idea of white raiment being the emblem of innocence and peace, which seems to have been very early entertained, would make every means for facilitating the removal of natural or adventitious stains more earnestly studied.

Accident would probably discover, that a certain degree of putrid fermentation carried off colouring matters from vegetable fibres. Hence the practice of macerating cloth in water, mixed with putrid urine, and the dung of domestic animals, which has been continued to our days.

From the earliest accounts we have of India, Egypt, and Syria, it appears; that these enlightened nations knew the efficacy of natron, (the nitre of scripture,) an impure mineral alkali, found in these countries, for combining with and carrying off the colouring matters with which cloth is stained; and it is still found in great abundance by the present inhabitants, and used for the same purpose. We are also informed by Pliny, (lib. xviii. c. 51) that the ancient Gauls were acquainted with the use of a lixivium, extracted from the ashes of burnt vegetables as a detergent, and knew how to combine this lixivium with animal oil to form soap.

But, though these nations appear to have early acquired some knowledge of the art of bleaching, the progress of improvement which they made in it, when compared with the advantages which some of them enjoyed, was very inconsiderable. The same practices seem to have been handed down from one genera-

tion to another, without any material improvement. In India, it would appear, that the art of bleaching, as well as that of staining cloths of various colours, are not in greater perfection at present, than they are described to have been in the days of Herodotus. Even in Europe, where the arts, after they have been once introduced, have generally made rapid progress, the art of bleaching made very slow advances till towards the end of the 18th century.

At this period, the oxy-muriatic acid, and its effects, were discovered by the justly celebrated Mr. Scheele; and its application to the art of bleaching, by Mr. Berthollet, has given it an impulse towards perfection, unknown in the history of any other art.* It now became evident,

* As the facts respecting the introduction of the new method of bleaching are not generally known, and have been greatly misrepresented by some late writers on that subject, we shall make no apology for laying them before our readers.

The first attempt to apply the oxy-muriatic acid to the art of bleaching, appears to have been made by Berthollet, about the year 1786, (*Ann. de Chim.* ii. 160.) Influenced by the most liberal views, he made no secret of his experiments: and exhibited some of them in presence of Mr. Watt, of Birmingham, who was instantly impressed with the importance of the discovery, (*Id.*) Early in the year 1788, an attempt was made by some foreigners to obtain a parliamentary grant; and, failing in that, a patent-right, for a new method of bleaching, which they professed would shorten the process, and reduce it to a few hours. Mr. Watt, however, having been made acquainted with Berthollet's discovery, and having actually applied it in practice to the whitening of 500 pieces of cloth, resisted this monopoly; and was joined by Mr. Henry and Mr. Cooper, of Manchester, both of whom had also been successful in their attempts to apply the acid to the bleaching of cotton goods, though their experiments were conducted on a smaller scale. The opposition was effectual, and the foreigners were foiled in their attempt to obtain a patent.

that oxygen had an affinity with the colouring matters with which cotton and linen manufactures are stained; and that, by a proper use of the alkalies, along with the oxy-muriatic acid, these colouring matters could be removed, and the goods rendered white, in a space of time almost instantaneous, when compared with the former method of bleaching.

Owing, most probably, to the distance of his seat from the cotton-manufacture, Mr. Watt did not himself embark in the practice of bleaching. Mr. Cooper, however, formed an establishment for the purpose of applying Mr. Berthollet's discovery; and Mr. Henry not only engaged in a similar undertaking, but gave, to some of the principal bleachers in this country, the first instructions which they received respecting the new process. The method of the latter gentleman at first consisted, sometimes in immersing the goods in a watery solution of the gas, or in an alkaline ley, impregnated with it, and sometimes in exposing the goods, previously moistened with water, to the action of the gas itself. Soon afterwards, he made a further improvement, in substituting lime for alkali, as a means of condensing the oxy-muriatic acid gas. An air-tight chamber was prepared, on the floor of which rested a stratum of lime and water, mixed together to the consistence of cream. Through this the goods were passed by means of a winch; and the chamber being filled with gas, the goods were alternately exposed to the lime-liquor, and to the acid vapour. Thus an oxy-muriate of lime was formed upon the cloth, which, after a sufficient continuance of the operation, was taken out, and exposed to the usual processes of washing, &c.

A very essential improvement in the application of lime, was, some years afterwards, discovered by Mr. Tennant, of Darnley, near Glasgow, and was secured to him by a patent, dated January 30th, 1798. It consisted in effecting a combination of oxy-muriate acid with lime, in a separate vessel, containing lime suspended in water, by mechanical agitation. The redundant lime was allowed to subside, and the clear liquid, a solution of oxy-muriate of lime, applied, properly diluted, to the purpose of bleaching. It is remarkable, that this combination, even

Of the Detergent, and other Substances used in Bleaching.

As it is of importance for the bleacher to be acquainted with the qualities of the substances he uses, and to know the proper methods of ascertaining their purity, we shall briefly point out the manner of arriving at the knowledge of this. The substances used in bleaching are chiefly.

1. Pot and pearl ashes.
2. Soda.
3. Soap.
4. Oxy-muriate of pot-ash.
5. Oxy-muriate of lime.
6. Manganese.
7. Muriatic acid.
8. Sulphuric acid.

Pot and pearl ashes, as they are imported from the United States of America, whence the principal supplies are derived, are of three different qualities: viz. first, second, and third sorts, the casks which contain them being branded by a hot iron with these distinguishing marks. As may naturally be supposed, the first sort is the best, the second next in quality, and the third sort the worst.

But the best pot-ash, as imported,

when the oxy-muriatic acid is perfectly neutralized, has the power of bleaching light or thin goods, though it is much less active in discharging some vegetable colours. Hence this method has certainly a great advantage over all former ones, in the facility and safety of its application, especially to coloured goods, which would be discharged by the contact of either the acid, or of lime in an uncombined form. This patent has since been set aside by the decision of a court of law, with what justice we do not pretend to decide. Mr. Tennant, however, still retains an exclusive right to a method, secured to him by a subsequent patent, of uniting the oxy-muriatic acid with dry quick-lime, and thus rendering the bleaching salt portable to any distance in the form of a powder,

is by no means an alkali free from impurity, it being only comparatively so when its value is estimated with respect to the inferior kinds. It never contains above 70 per cent. of real alkali, but more frequently from 60 to 65 per cent.; the remainder of the mass consisting of sulphate and muriate of pot-ash, muriate of soda, a portion of uncombined charcoal, carbonic acid, and five or six per cent of water. As these substances possess no detergent qualities whatever, it is the interest of the bleacher to purchase only those kinds of pot-ash which contain the smallest portion of these adventitious salts. The second sort of pot-ash is often very impure, and the third or lowest quality is frequently designedly mixed with common salt, in order to increase the weight. The same observations are applicable to pearl-ashes, which differ from pot-ash only in containing a greater proportion of carbonic acid, and consequently are what is termed a milder alkali.

When a solution of pot or pearl-ashes is made by bleachers, it is customary to ascertain the strength of the solution by the hydrometer, an instrument admirably calculated for this purpose, were these salts always of the same degree of purity. But as this is not the case, we shall point out two methods whereby this may be ascertained with a sufficient degree of accuracy.

It is a fact well known to chemists, that the strength of an alkali is in proportion to the quantity of any acid required to saturate it. Thus, if an ounce of one kind of pot-ash requires for saturation a given quantity of sulphuric acid, and an ounce of another kind of pot-ash requires twice that quantity, the latter is twice as strong as the former.

In order, however, to obtain a sufficiently accurate standard of com-

parison, it will be necessary always to employ an acid of the same strength. This may be effected sufficiently well for ordinary purposes, by diluting the common sulphuric acid of commerce to the same degree by the hydrometer. For example, let the standard consist of one part of acid, and five of water. After the mixture has cooled down to the temperature of 60 degrees of Fahrenheit's thermometer, observe the height to which the hydrometer rises, and make this the standard for subsequent trials. The strength of an alkali will now be learned, by observing what quantity of this acid a given quantity of the alkali under trial requires for saturation. For this purpose put half an ounce of the alkali into a jar, with a few ounces of water, and filter the solution; weigh the diluted acid employed before adding it to the alkali; then pour it gradually into the solution till the effervescence ceases, and till the colour of litmus paper, which has been reddened with vinegar, ceases to be restored to blue. When this happens, the point of saturation will be attained. Weigh the bottle, to know how much of the acid has been added, and the loss of the weight of the acid will ascertain the strength of the alkali.

Another method recommended by Dr. Higgins of Dublin, for ascertaining the purity of potash, is, to take a given quantity of the alkali, and dissolve it in twice its weight of boiling water, stirring the mixture during the solution of the salt; while yet warm, it must be filtered through unsized paper. When all the liquor has passed through the filter, a very small quantity of cold water is gradually poured on the saline residuum on the filter, in order to wash out the remainder of the alkali. The undissolved salt remain-

ing on the filter, is sulphate of potash, which must be carefully taken off, dried and weighed, in order to ascertain its quantity. To determine whether any common salt is contained in the alkali which has been filtered, evaporate the clear solution a little in a sand bath, and set it in a cool place for 24 hours; at the end of which time, any common salt it may contain, will be found crystallized in the form of regular cubes at the bottom of the vessel. The sulphate of potash and common salt being dried, weighed, and deducted from the weight of the crude alkali employed, will give the precise weight of the pure alkali it contains.

Pure carbonate of soda, or the mineral alkali, so much resembles the vegetable alkali, when used as an agent in bleaching, that little difference is observable in its effects, when the strength of the alkaline leys and every other circumstance are the same. The high price at which soda has hitherto sold, has prevented its being generally used at the bleachfield; but since more economical processes are adopted in the manufacture of it, and since it is made in a greater degree of purity, its introduction into the bleachfield will naturally follow. It is admirably calculated, as a detergent, for the finishing of the finer fabric of muslin; it being ascertained beyond doubt, that 6 ounces of pure carbonate of soda, together with 10 ounces of soap, produce effects in bleaching, equal to $1\frac{1}{2}$ pounds of soap, when used by itself.

Barilla, as imported from Allicant in Spain, is in large masses, of a dark gray colour. It usually contains from 20 to 24 per cent of pure mineral alkali, and never above 33 per cent, when in a state of the greatest purity. The remainder of the mass usually consists of sulphate,

and sulphite of soda, with a large proportion of charcoal and common salt.

The best method of extracting the soda from barilla, is to pound it, and fill a large wooden vat with it, the bottom of which has been previously covered with straw, to act as a filter; the vat is then filled with cold water, which is allowed to remain for some time to dissolve the salt. When sufficiently strong for use, the solution is run off at the bottom of the vessel by a stopcock, by which means it is freed from the charcoal and other impurities. Fresh water is again poured on the barilla, until the whole of the salt is dissolved. By this operation the soda is extracted, which being a very soluble salt, is easily dissolved by the water; but, at the same time, the common salt, which is equally soluble, together with a portion of the sulphate of soda, is also dissolved, which contaminate the solution, and have no effect as detergents. On this account, pure soda is certainly preferable for bleaching, (when it is not too high priced,) as it contains none of the foreign salts contained in barilla, which retard, in place of promoting the process of bleaching. The bleachers in Ireland formerly used large quantities of barilla, but its use is now almost universally given up, pot-ash being substituted in its stead.*

Kelp would be unworthy of notice, were it not that it is still recommended by some as a detergent in bleaching.

As at present manufactured, kelp is very inferior in this respect: The

very best Scotch kelp never contains above 7 or 8 per cent. of mineral alkali, but more commonly from 3 to 5 per cent. Considering the other impure substances contained in kelp, it is at present unworthy of attention. But there is no doubt, that if proper methods were adopted for the manufacturing of it properly, it may be very much improved in quality. In the present rude manner in which it is made, the marine plants called *Fucus Serratus*, and *Fucus Vesiculosus* of Linnæus, being cut at midsummer, and dried by the sun and air, are burnt in holes made in the sea beach: when a large portion of it is burnt together, part of the salt fused by the strong heat combines with sand, and other earthy matters, and forms an imperfect glass. In a furnace properly constructed, with a graduated heat, we have known kelp made of a quality far superior to the very best of that which is made by the common process.

It has been suggested that were the sea plants, from which the kelp is made, previously washed in fresh water before they are dried, they would thereby be freed from a large portion of the marine acid adhering to them, which remains undecomposed during the burning of the plant, when it is converted into kelp. This theory supposes, that the plant, during the progress of its growth, has the power of decomposing the sea-water, and retaining soda as one of its component parts: and that if this be the case, and if the combustion of the plant were properly conducted, a salt nearly equal in value to barilla would be the product. These facts may be easily proved by those who have skill to ascertain, and opportunity to investigate, a matter which is of considerable national importance.

In order to ascertain the quantity

* This is, in some degree, a mistake. Barilla is still used in considerable quantities in some bleachgreens in Ireland, especially in those districts in which the finest linens are bleached.

of real alkali contained in the different detergent salts used in bleaching, M. Descroizilles, Sen. employed the method before-mentioned, by saturating a given quantity of the alkaline salt with diluted sulphuric acid, the specific gravity of which was always the same.

After many thousand trials during the course of 25 years practice, the following are the mean results:

	<i>Real alkali in 100 parts.</i>	
Best American Pearl Ashes,.....	60	73
Caustic ditto pot ashes in reddish lumps,.....	60	63
Second ditto ditto in gray lumps, 50	55	
Second ditto pearl ashes,.....	50	55
White Russian pearl ashes,.....	52	58
White Dantzic ditto,.....	45	52
Alicant barilla,.....	20	33
Inferior kinds of barilla,.....	10	15
Natron,.....	20	30
Salt of tartar of the shops,.....		72

To these may be added the following from Mr. Kirwan's tables of the composition of salts:

	<i>Alkali.</i>	<i>Acid.</i>	<i>Water.</i>
Crystallised carbonate of potash,.....	41	43	16
Ditto carbonate of soda,.....	21½	14½	64
Ditto ditto desiccated, 60		40	

Hence it appears evident, of what importance it is to bleachers, and others who use alkalis in any quantity, to have it in their power to ascertain the quantity of pure salt contained in them; as, by a proper knowledge of this, great saving may be made by them in the course of their business.

Soap is an article so well known, that it requires no particular description. It is sold of three different kinds, viz. brown, white, and soft soaps. It is the two latter kinds which are chiefly used in bleaching; the former being commonly sold for

household washing in some parts of Britain.

Of all the agents used in bleaching, there is none of them which ranks higher for giving facility and dispatch to the various operations, than the oxy-muriatic acid.

We might, even at this moment, have been unacquainted with the cause of the destruction of the colouring matter of vegetable substances, if the discovery of this acid and its effects on colouring matter, had not pointed it out to us. For this discovery, and its inestimable advantages, the arts are indebted to the celebrated Scheele. While employed in making experiments on manganese, about the year 1774, he noticed its powers in rendering vegetable substances colourless, more as a matter of curiosity than of use. Having communicated his observations to Berthollet, in France, about the year 1786, the latter lost no time in applying the properties of this curious and interesting substance to the most important practical purposes. His application of it to the bleaching of cotton and linen cloth proving successful, he published the result of his experiments in the year 1789. The new method of bleaching was quickly and successfully introduced into the manufactories of Rouen, Valenciennes, and Courtray; and soon after into those of Manchester and Glasgow; and it has since been generally adopted in Great Britain, Ireland, France, and Germany. The advantages which result from this method of bleaching, in every season of the year, can be best appreciated by commercial people, who experience its beneficial effects in many ways, but particularly in the quick circulation of their capitals.

Great difficulties at first impeded its progress, arising chiefly from prejudice, as well as from the ignorance of the bleachers in chemical

processes. These obstacles were, however, soon removed, by the assistance of several eminent chemists at Glasgow and Manchester, particularly Messrs. Watt, Henry, and Cooper. [See Note, p. 395.]

Mr. Berthollet's process for forming the oxy-muriatic acid, consisted in distilling one part of the black oxide of manganese with two parts of muriatic acid, in a glass retort: the product of the distillation was received in glass bottles, properly applied, when the quantity was small, or into a receiver lined with lead when the quantity was larger.

From the volatility of the oxygen as united with the muriatic acid, when simply diffused in water, with which it has a very slight affinity; and, consequently, its unequal action on the goods which were immersed in it for the purpose of being whitened; and its discharging those colours which were woven into the goods intended to remain permanent; as well as the suffocating vapours arising from it proving hurtful to the health of the workmen employed, it soon became evident, that the application of it in an extensive manner would be impracticable, if these difficulties were not more or less removed. Various attempts were made to effect this; and since it has been accomplished, a number of persons have put in their claims as the inventors of so advantageous an improvement. Mr. Higgins of Dublin, and Mr. Berthollet, had both combined the oxy muriatic acid with pot-ash, so early as the year 1788. The knowledge of the latter's having done so, and that the acid was thereby deprived of its offensive smell, induced the bleachers at Javelle, in France, to add a solution of caustic pot-ash. Hence the oxy-muriatic acid, combined with an alkali, is usually known by the name of *Javelle liquor*.

Notwithstanding this evident improvement, it was still generally maintained by chemists, that the oxy-muriatic acid, united simply with water, possessed greater bleaching power than that which is combined with caustic alkali; but this was contradicted by the practical bleachers, whose experience taught them, that though the acid, thus combined with an alkali, whitened with somewhat less rapidity, it had the advantage of retaining the gas much longer in open vessels, and of preserving fixed dyed colours, such as the Turkey or Adrianople red. These facts are now so fully established, that although several attempts have been made, since the year 1796, again to introduce the oxy-muriatic acid, diffused simply in water, into air tight vessels, to prevent its offensive smell, yet, from a conviction of its absurdity, it has been adopted only by a few.

In order to produce the oxy-muriatic acid, bleachers follow different methods to obtain a liquor which they suppose possesses the highest bleaching powers. In one point they generally agree, which is, in giving a superabundance of the materials employed, by which they are certain of procuring a liquor which possesses high bleaching powers. One of the most common proportions of materials employed for making this acid, is to take equal parts, by weight, of common salt and manganese, which are intimately mixed together. Some bleachers moisten the mixture with water, to the consistence of a thick paste, so that the dissolved salt may incorporate more intimately with the manganese. An equal weight of sulphuric acid is taken as of the other materials, which is diluted with its bulk of water, and allowed to cool before being poured into the retort on the combined salt and manganese.

The charge for the distillation thus consists of equal parts of salt, manganese, and sulphuric acid, diluted with an equal bulk of water.

In the above proportion of the materials, it is evident, that the quantity of sulphuric acid employed, is more than sufficient for expelling the muriatic acid from the salt; two-thirds of the former acid being enough to disengage the latter at a moderately high temperature. Hence when equal parts of salt, manganese, and diluted sulphuric acid, are used in the distillation of the oxy-muriatic acid, the residuum taken from the retort is uniformly found to be super-sulphate of soda, combined with manganese. The quantity of manganese used is also too great, and much of this substance is wasted, no more being necessary than is sufficient fully to oxygenise the muriatic acid during the distillation.

At the same time, it is proper to remark, that the proportion of manganese must be subject to variation according to its quality.

Mr. Rupp, of Manchester, (Trans. of the Lit. and Phil. Soc. of Manchester, vol. v.) recommends, manganese 3 parts, common salt 8, sulphuric acid 6, water 12. The bleachers in the neighbourhood of Glasgow commonly use equal parts of salt, manganese, sulphuric acid, and water, as mentioned above. In Ireland, the common proportions are said to be, manganese, 6 parts, common salt 6, sulphuric acid 5, water 5. In France and Germany, we understand, they vary little from the following: manganese 20 parts, common salt 6½, sulphuric acid 4½, water 54.

Besides the above methods of making the oxy-muriatic acid, that which was originally introduced by Mr. Berthollet, has again been used by several bleachers, on account of the

high price of pot-ash. It consists of introducing one part of oxide of manganese into the retort, on which is poured two parts of muriatic acid, of the specific gravity of 1200, which is diluted with its bulk of water.

The reason given by those who have again resorted to the latter process for making this acid, is, that one-half of the quantity of alkali is sufficient for neutralizing it in the receiver; because the oxy-muriatic acid gas is presented in a pure state, without any mixture of sulphureous acid gas, which they suppose is always produced by a part of the sulphuric acid being decomposed in the retort, by the impurities mixed with the oxide of manganese; and that, in consequence, one-half of the alkaline lixivium is sufficient, no more alkali being necessary than a sufficiency to retain the oxy-muriatic acid gas in a proper state of neutralization for the purpose of bleaching. Whatever of theory may be in these inferences, it is certain, that bleaching liquor made in this manner possesses power equal, if not superior, to any in use, for rendering goods white expeditiously.

We shall now describe the preparation of the oxy-muriatic acid combined with pot-ash, as conducted in the apparatus invented by Mr. Fisher.

Supposing the receiver to contain 120 gallons English wine measure, it is filled with a solution of caustic pot-ash of the specific gravity of 1015; the lead stopper is then replaced. Twenty one pounds of common salt being intimately mixed with fourteen pounds of the black oxide of manganese, the mixture is moistened with water, and wrought together until it is of the consistence of moist dough. By these means, the salt, in a state of solution, unites more intimately with the manganese. The

top of the retort being removed, the salt and manganese are put into it ; the cover is then replaced, and firmly screwed on its place.

Into 16 pounds of sulphuric acid pour gradually the same weight of water, and allow the mixture to cool. One half of the diluted acid is poured, by a lead funnel, into the retort, which is then closed by the lead plug to prevent the escape of the oxy-muriatic acid gas which is instantly disengaged, after which a violent agitation is heard in the receiver. The distillation is usually begun in the evening, and the workman, after seeing the operation going properly forward, leaves it to work of itself. In the morning, the distillation having abated, the remainder of the diluted sulphuric acid, is poured into the retort, when a fresh disengagement of the gas takes place. As soon as it is observed to slacken, a fire is put into the furnace, in order to heat the boiler, which is filled with water, into which chaff or any similar light substance is put to prevent the evaporation of the water. By the increased heat of the water, the distillation goes forward with renewed vigour ; and the fire is continued until no more gas is disengaged, which is known by the bubbling noise in the receiver being no longer heard. The oxy-muriatic acid combined with pot-ash may now be drawn off by the stop-cock from the receiver for use.

In the above process, the sulphuric acid having a greater affinity for the soda contained in the common salt than that which the muriatic acid has, the latter is disengaged from the soda, and, acting on the manganese, it deprives it of its oxygen, which now existing in the state of oxy-muriatic acid gas, by its expansive force is impelled forward through the tubes, into the receiver,

where it is absorbed by the caustic alkaline solution.*

No farther improvements seem to have taken place in the combination of this acid with any other substance than the alkalis, until the year 1798, when Mr. Charles Tennant, of Glasgow, by a well conducted series of experiments, showed, that it was capable of being united with what are called the alkaline earths, such as barytes, strontites, and lime. Lime being most readily procured, after a number of trials he found, that, by mechanical agitation, and in consequence of the suspension of the finer particles of the lime in water, it readily united with the oxy-muriatic acid gas, and was thereby completely dissolved. When, therefore, a sufficient quantity of finely pulverised quicklime is put into the receiver, in place of pot-ash, and mechanically agitated during the distillation of the oxy-muriatic acid, it will be found that it is entirely dissolved, and forms a pure and transparent solution of oxy-muriate of lime, possessing the same power of retaining the gas as the alkalis do.

Mr. Tennant has since carried this improvement to a greater degree of perfection, by combining the oxy-muriatic acid with quicklime, in the dry way, and thus rendering it portable to any distance, at a small expence. This discovery is of great importance, as, by means of so common and cheap a substance as lime, great savings are made by the

* Dr. Ogilby, in our last Number, appears to have fallen into a mistake, by stating that oxy-muriate of lime is almost exclusively used by the bleachers in Ireland. Many prefer the oxy-muriate of pot-ash, as supposing it freed from the dangers attendant on the risque of the lime not being completely dissolved.

bleacher in the expence of alkali ; and this improvement may not be improperly called a new era in the history of bleaching.

For use, the concrete oxy-muriate of lime is diffused in water by agitation ; the insoluble matter contained in the lime is allowed to subside until the liquor is transparent. When drawn off for use, it is further diluted with water, before the goods are immersed in it, in order to be whitened.

Sulphuric acid, or oil of vitriol, as it is commonly called, when pure, is a transparent, colourless fluid, slightly viscid, and without smell. The specific gravity of the sulphuric acid of commerce is generally 1850, or almost twice the weight of distilled water. The manufacture of it is now carried on to such extent in Great Britain, that any further description of a substance so well known is unnecessary. The only substances with which it is ever adulterated, are lead, and super-sulphate of pot-ash. A small portion of lead is taken up during its formation, in chambers of that metal, and its subsequent concentration in boilers. On this account, a white precipitate is often found in the bottom of the bottles containing it, which is sulphate of lead. After the combustion of the sulphur and nitre in the manufacture of sulphuric acid, super-sulphate of pot-ash is left as a residuum, by the affinity of the pot-ash contained in the nitre with the sulphuric acid. Some manufacturers add a strong solution of this salt to the water which is put into the lead chambers where the sulphuric acid is formed. Now, in proportion to the quantity of pot-ash contained in this solution, in so far is the specific gravity increased, and, in consequence, the sulphuric acid is rendered ineffectual for answering the purposes of bleaching.

This adulteration is carried so far as frequently to leave only four-fifths of pure acid.

The muriatic acid of commerce has generally a slightly yellowish tinge, which proceeds partly from the impurities contained in the common salt from which it is made, and partly from its being distilled in iron retorts. When distilled in glass vessels from pure salt, the muriatic acid is perfectly colourless, and its specific gravity is about 1170.

(*To be continued.*)

Account of the Culture and Preparation of Hemp, in Dorsetshire ; by H. B. Way, Esq., of Bridport Harbour.

(*From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Agriculture.*)

HEMP is usually sown about the 15th of May, on the most arable land, on which about twenty cart loads of good rotten dung has been spread, say about a ton to the load ; this is well ploughed in, and the ground well ploughed two or three times, and well dragged and harrowed, to get the soil as fine as possible, and about two, or two and a half bushels of seed sown to the acre ; what produces no seed, called by some male or summer hemp, and by others cinner hemp, is drawn about five or six weeks after the plant comes up ; it is at that time in blossom ; when drawn it is tied up in bundles, and carried to some meadow land, and there spread to ripen : when ripe and dry it is bundled and stacked. What stands for seed has no flower that can be discovered ; it is the female hemp, and is generally ripe early in September, when it is drawn, bundled up, and stowed up in the field for the seed to dry and harden, when it is thrashed out in the fields. Most